Edgewood Area - Aberdeen Proving Ground, Maryland 21010-5424
U.S. Army Soldier and Biological Chemical Command

Panoramic-Imaging Infrared Solid-State Spectrometer (PANSPEC)

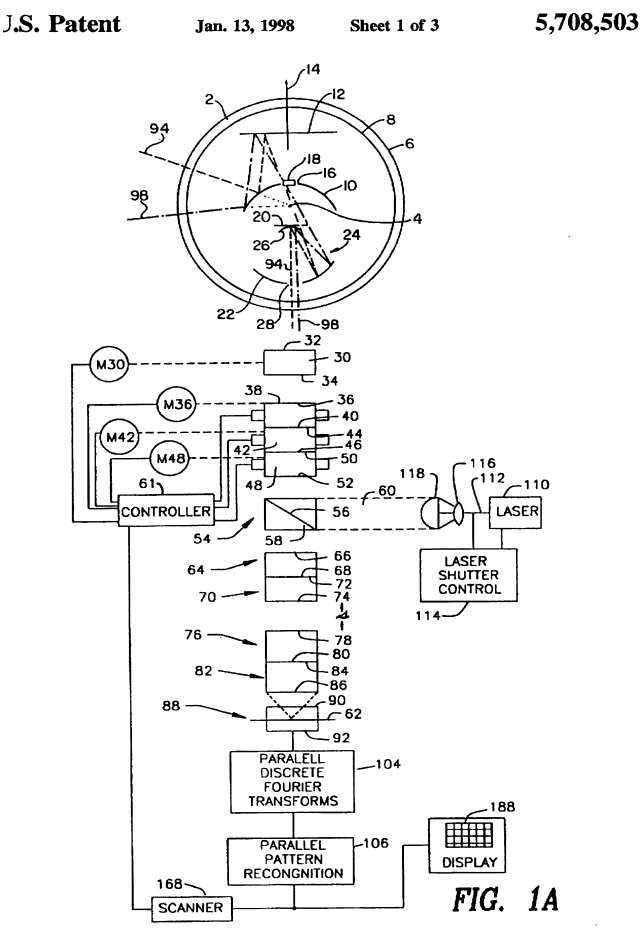

FIG. 1A

PANSPEC is a computer-designed spectroradiometer that monitors a panoramic infrared environment for chemical clouds, detecting the cloud's presence once absorption or emission spectra characteristic of the chemical species is resolved pixel-by-pixel at sensor's focal plane array. It comprises high-speed solid-state interferometer technology (no moving parts) and a neural network pattern recognition system for ascertaining chemical presence in real-time, during passive operation. Furthermore, PANSPEC's optical fusion design allows for encrypted electro-optical beam communications of presence and heading of a chemical cloud.

The PANSPEC optical design effort may guide prototype development of a future remote sensor serving these tasks: (1) tactical reconnaissance missions when on-board tracked or wheeled vehicles; (2) atmospheric sensing when on board surveillance aircraft; and (3) surface contamination detection when combined with laser or maser radiation sources for directed heating, as in the transmitter component of a thermal luminescence sensor (TLS).

Each optic group of PANSPEC was defined in function, and sequentially structured into collector, collimator, interferometer, and imager optical components. A final ray-tracing goal is clear demagnified infrared imagery of a panoramic object scene. This is done strictly by computer optimizations in which infrared wavefront and diffraction, Siedel coefficients, defocusing, Strehl ratio, and Modulation Transfer Function (MTF) parameters meet certain criteria at PANSPEC's image plane. After final optimization is attained, a computer-generated image of a digitally constructed template object, positioned within the sensor's field-of-view, is inspected.

An encrypted CO_2 laser beam can be made to traverse PANSPEC in reverse direction (toward object space) starting at its collimating optic stage. This beam carries a modulated intensity for omnidirectional broadcasting of on-coming chemical cloud events.

References:

1. Panoramic Infrared-Imaging Spectroradiometer Model With Reverse Phase-Modulated Beam Broadcasting, Arthur H. Carrieri, Applied Optics, 36(9), 1952-1964, 20 March 1997, COVER ARTICLE.

2. Panoramic Infrared-Imaging Spectroradiometer With Reverse Phase-Modulated Beam Broadcasting, U. S. A. patent number 5,708,503, issued to the U. S. Army, April, 1997, A. H. Carrieri, inventor.

Rev. 03-19-01